Fisheries and Oceans / Pêches et Océans

THE ECONOMIC EFFECT OF INCREASING THE LEGAL LOBSTER CARAPACE LENGTH

PROGRAM COORDINATION AND ECONOMICS BRANCH
NEWFOUNDLAND REGION

NOVEMBER, 1986

Canada

THE ECONOMIC EFFECT OF INCREASING THE LEGAL LOBSTER CARAPACE LENGTH

Brian Donahue
Program Coordination and Economics Branch
Newfoundland Region

November, 1986

TABLE OF CONTENTS

		PAGE
I.	**INTRODUCTION**	1
	i) Problem Statement	1
	ii) Proposed Solution	3
II.	**THE MARKETS**	5
	i) The American Market	5
	ii) The Newfoundland Market	7
III.	**ANALYSIS OF INCREASE IN CARAPACE LENGTH**	9
	i) Changes in Landings	9
	ii) Pricing Considerations	12
	ii) Changes in Landed Value	15
IV.	**CONCLUSION**	25

LIST OF TABLES

TABLE		PAGE
1	Canadian Exports of Live Lobster	6
2	Provincial Test Site Data	10
3	Changes in Lobster Landed Weight with Increases in Minimum Legal Size - Newfoundland Region	12
4	Projected Lobster Revenues, 1985-1994	16
5	1984 Sampled Lobster Enterprises	19
6	Lobster Enterprise Average 1984 Landings (kg)	20
7	Lobster Enterprise Average 1984 Landed Value	20
8	Number of Enterprises Range of Landed Values of Lobster Landings	21
9	Contribution of Lobster to Enterprise Revenue	21
10	Changes in Total Landed Value (All Species) for the Average (Sampled) Inshore Lobster Enterprise	22
11	Changes in Lobster Landings and Value for the Average (Sampled) Inshore Enterprise in Area B - Notre Dame Bay	23
12	Changes in Lobster Landings and Value for the Average (Sampled) Inshore Enterprise in Area C - Bonavista Bay	23
13	Changes in Lobster Landings and Value for the Average (Sampled) Inshore Enterprise in Area H - Placentia Bay	24
14	Changes in Lobster Landings and Value for the Average (Sampled) Inshore Enterprise in Area I - Fortune Bay	24

I. INTRODUCTION

(i) Problem Statement

One of the major potential problems in the Newfoundland lobster fishery is the likelihood of stock failure. The lobster fishery is not managed under a quota system, making any lobster (except for egg-bearing females) in excess of the minimum legal size eligible for capture. Yield per recruit assessments indicate that current exploitation rates are considerably in excess of those that would maximize yield per recruit at the current minimum legal size.[1] In addition, egg production, and presumably subsequent recruitment to the stocks, is substantially less under current conditions than that which would occur with an exploitation rate and minimum legal size that would maximize yield per recruit.[2] Catches from 1978 to 1985 have, however, remained fairly consistent in Newfoundland, averaging 5 million lbs. with a landed value averaging 10 million dollars. With the high levels of exploitation that have been identified, it is becoming more likely, as time goes on, that recruitment cannot be indefinitely maintained at these recent levels. Study site results show that recruitment to standing stocks (the commercially legal portion of the population) has fluctuated markedly during the past 15 years. It is not known to what extent, if any, variation in total annual egg production contributed to recruitment fluctuation.

1 The Newfoundland Lobster Fishery: A Review of Statistics, Stock Status and Current Management Considerations, G.P. Ennis, Fisheries Research Branch, DFO, 1982

2 Ibid, p. 3

More than likely it was variation in environmental conditions resulting in year to year variation in larval survival rates and/or growth and survival of juveniles that contributed most to recruitment variations.[3] It is the potential for recruitment failure that is perceived by resource managers as a major problem in the Newfoundland lobster fishery.

Although egg bearing female lobster below the current legal minimum of 3 3/16" are present in Newfoundland waters, this does not mean that recruitment failure is unlikely. There is a serious concern that this legal minimum provides for only a minimum level of spawning stock which would not supply sufficient recruitment for landings to be sustained continuously at recent levels. There is no data currently available on the impact on catches of a recruitment failure or on the likely magnitude of such a recruitment failure.

As effort in the Newfoundland fishery increases, resulting in even higher exploitation rates, average annual egg production will decline and so will average recruitment. The possibility of this kind of recruitment failure is very real. Even if exploitation rates do not increase beyond current levels, average recruitment will continue to be much lower than it could be and yield per recruit will also continue to be much lower than it could be.[4]

3 G.P. Ennis, Science Branch, DFO, Newfoundland Region

4 G.P. Ennis, Science Branch, DFO, Newfoundland Region

(ii) Proposed Solution

One of the options identified as a means of improving the condition of the Newfoundland lobster fishery is to increase the minimum legal carapace size of lobster from 3 3/16" to 3 1/2". This can either be a phased in process over two or three years or, as this report considers, a one year implementation process. This proposed increase in the minimum legal size is based upon the long-term objective of improving yields from the resource by increasing yield per recruit. Also, an increase of this size will offer protection to a greater proportion of the spawning stock, thereby increasing egg production and contributing to greater population stability. In the Newfoundland lobster fishery today, approximately 85 percent of available commercial legal lobsters are harvested annually, with the level of exploitation as high as 95 percent in some locations.[5] Although it appears that recruitment in lobster stocks is highly dependent on environmental conditions, it is likely that the level of recruitment is greatly limited by the relatively low level of egg production under existing conditions in the fishery.[6]

5 The Newfoundland Lobster Fishery: A Review of Statistics, Stock Status, and Current Management Considerations, G.P. Ennis, Fisheries Research Branch, Fisheries and Oceans, 1982

6 Fisheries and Population Biology of Lobster (Homarus Americanus) at Arnolds Cove, Newfoundland, G.P. Ennis et al., Fisheries Research Branch, Fisheries and Oceans, Newfoundland Region, April, 1986.

In any fishery that is heavily dependent on recruitment, slight variations in recruitment can result in substantial fluctuations in landings from year to year[7]. Even under an ideal fisheries management regime, natural fluctuations in abundance of lobsters (and hence landings) will occur, but under a management regime that is characterized by excessive exploitation rates and a minimum legal size that is too small, fluctuations can be expected to be far more dramatic.[8] These fluctuations may translate into significant income changes in a fishery that, for example, generates as much as 75 percent of inshore earnings of the average (sampled) lobster enterprise in Fortune Bay.

The next section of the report takes a look at the two main lobster markets for the Newfoundland lobster catch: the American market and the local Newfoundland market. The analysis section that follows addresses the impact of increasing the carapace length on lobster landings, pricing considerations associated with these fluctuations and the resultant changes in landed value.

7 The Newfoundland Lobster Fishery: A Review of Statistics, Stock Status and Current Management Considerations, G.P. Ennis, Fisheries Research Branch, DFO, 1982

8 Ibid

II. THE MARKETS

(i) The American Market

The American lobster market follows a yearly cycle. Typically, first quarter supplies are low from both the United States and Canada and prices tend to reach their annual maximum. Canadian imports tend to contribute as much as 70 percent of the supply during this period (consisting mostly of pounded lobsters).[9]

The Newfoundland lobster fishery begins in April and prices usually begin to decline until the fall season. Most Canadian fisheries close in July and then U.S. imports of Canadian lobsters decrease significantly; however, U.S. landings remain high over this period and prices do not bottom out until September. In the November-December period, Canadian imports to the U.S. market begin to pick up again (mainly from Nova Scotia), while at the same time the U.S. harvest is declining and U.S. imports again exceed domestic supply. Prices usually begin to improve again during this period of the year.

During 1985, strong demand conditions characterized the Canadian export market for live lobster. The total value of Canadian exports increased by over $17 million from the 1984 level with over 90 percent of the increased production going to the U.S. market. Despite an increase in supply of 1300 tonnes, average U.S prices per

9 Marine Policy: Canadian Lobster Imports and the New England Lobster Industry, N. Hasselback, J. Dirlam, J. Gates; January, 1981.

pound increased slightly. Sales to Europe and Japan also continued to grow and prices in Europe also improved. In terms of tonnage, Canadian live lobster exports expanded by 15 percent to the U.S. and by 16 percent to Europe. The table below shows 1985 Canadian exports of live lobster by destination:

TABLE 1

CANADIAN LOBSTER EXPORTS, 1985

Country	Quantity (t)	Value ($000)
United States	10,014	95,333
Netherlands	201	2,064
Belgium	163	2,220
FRG	156	2,121
Japan	134	2,292
UK	80	1,034
Switzerland	66	979
France	61	737
Otner	56	751
Total	10,931	107,531

Source: Shellfish Market Bulletin, December, 1985.

(ii) The Newfoundland Market

The Newfoundland market consists of two components: local sales made directly by fishermen to consumers which over the 1980-1985 period, averaged 9 percent of total Newfoundland Region landings; and local sales of lobster by licenced commercial buyers. Purchases of lobster from fishermen made by registered buyers may be sold on the local Newfoundland market or shipped outside the Province. In order to get a more complete measure of the total local sales market, the volume of local sales made by these registered buyers (who are either exporters, buyers agents or retailers) has been estimated below.

In four Newfoundland Region areas of largest lobster landings, Notre Dame Bay, Bonavista Bay, Placentia Bay and Fortune Bay, local sales directly by fishermen tends to average about 9 percent.

Fisheries Statistics and Systems Branch monitors the sales of Commercial Lobster buyers through the Annual Report of Sales of Specified Products (Fish Processors, Packers, and Handlers). These reports show, for each buyer:

1. Total sales outside the fish processing and packing industry which includes exports or sales on behalf of the buyer to fish brokers, domestic wholesalers and retailers or sales directly to consumers.
2. Sales to fish processors and packers in the other four Atlantic Provinces (including Quebec).

Item (2) above, clearly indicates exports of lobsters from the Province; however, Item (1) covers both domestic sales and exported product sales. The sales of lobster in the Gulf Region of the Province are mainly for the export market with major purchases by the United Maritime Fishermen (UMF) at Port au Choix and local buyers shipping outside the Province.

Analysis of the Sales of Specified Products indicates that, in the Newfoundland Region, approximately 15 percent of fishermen sales to commercial buyers are subsequently sold to domestic sources (retailers, consumers, etc). Adding these sales to the direct local sales (10 percent) brings total domestic lobster sales to approximately 25 percent of total lobster landings in the Newfoundland Region. This represents local consumption of lobster and amounts to an estimated 340 tonnes of lobster (750,000 lbs.) per year.

III. ANALYSIS

(i) Changes in Landings

The short-term yield loss associated with increasing the minimum legal size to 3½" over a one-year period has been estimated for six localized study areas (Table 2) on the assumption that exploitation rates and recruitment were stable over the three-year period, 1975-1977.[10] The analysis that follows is, however, based on the 1984 fishery and projects the probable results if the change in minimum carapace size had been implemented in the following year (1985).

For each of the test sites, size frequency distributions of lobsters have been monitored since 1970. For example, at Arnolds Cove, based upon the sampling of both male and female lobsters during 1975 to 1977, approximately 57 percent of lobsters fall between the present legal minimum of 3 3/16" and the proposed legal minimum of 3 1/2". As Table 2 shows, this number of lobsters represents approximately 49 percent of total landed weight in the area. Although these data are somewhat outdated, research has shown that the size frequency distribution has been very stable from 1975 to 1984.[11] An increase in the legal carapace measure will shift the size distributions to a higher mean carapace length. The study data assumes a constant level of recruitment over the 1985-1995 period.

10 Average Loss to Fishermen in Landings and Value with Increase in Minimum Legal Size of Lobster from 3 3/16" to 3½", G.P. Ennis.

11 Fisheries and Population Biology of Lobster (Homarus Americanus) at Arnolds Cove, Newfoundland, G.P. Ennis et al., Fisheries Research Branch, DFO, Newfoundland Region, April 1986.

The test site data is described in Table 2 and indicates that weight losses in the initial year could range from 30 percent to 72 percent depending upon the area. However, for the purposes of this report, the analysis will be presented for each of the four main lobster harvesting areas: (Notre Dame Bay, Bonavista Bay, Placentia Bay and Fortune Bay), assuming that the Provincial average test site data is representative of these large areas.

TABLE 2
PROVINCIAL TEST SITE DATA

Test Sites	% Loss of Weight During Year of Implementation
Bellburns (N)	66%
Bellburns (S)	54%
Comfort Cove	72%
Burnside - St. Chad's	45%
Arnold's Cove	49%
Boswarlos	30%
PROVINCIAL AVERAGE	53%

An increase in the minimum legal size will result in losses of landed weight and thus revenue losses, during the first two years of its operation. After the third year, fishermen can expect increased landed weights and begin to recoup the initial revenue losses. From an investment standpoint, the impact of the revenue losses in the first two years will be compared with the revenue gains in subsequent years. Comparison will also be made of the impact of these short-term lobster revenue losses on total revenues from all species of the average fisherman.

The data suggest that fishermen can expect, on average, a 53 percent decrease in total landed weight during the year of implementation (1985) of an increase in the legal carapace size. In the following year (1986), landings will more than double vis-a-vis 1985 but remain 5 percent below the base year (1984) landings. In 1987 and beyond, landings are projected to increase to a level of 22 percent above the base (1984) year landings. (Table 2). The increase in total landed weight of lobster in 1986 as compared to 1985 is an addition through growth of the existing lobsters. The 22 percent increase in landings represents the full effect of the increased yield/recuit which will continue to be realized in subsequent years.[12] Increased recruitment from the increased egg production that will also result from a size limit increase will not occur until 8-10 years later.[13]

In 1984, Newfoundland Region lobster landings totalled 1,364,874 kg., having a landed value of $7,788,000. Data for the preceding period indicate that a catch of 1,364,874 kg. is fairly typical. If it is assumed that 1985 represents the year of implementation of the regulation and that 1984 represented a typical year for the lobster fishery, the changes in landed weight are described in Table 3.

12 Average Loss to Fishermen in Landings and Value with Increase in Minimum Legal Size of Lobster from 3 3/16" to 3½", G.P. Ennis

13 G.P. Ennis, Science Branch, DFO, Newfoundland Region.

TABLE 3
CHANGES IN LOBSTER LANDED WEIGHT WITH INCREASE IN MINIMUM LEGAL SIZE
NEWFOUNDLAND REGION

YEAR	Landed Weight
1984	1,364,874 kg.
1985	641,491 kg.
1986	1,296,630 kg.
1987	1,665,146 kg.
1988	1,665,146 kg.

Landings are projected to decline to 641,491 kg. in 1985, increase to 1,296,630 kg. in 1986 and increase further to 1,665,146 kg. in subsequent years.

(ii) Pricing Considerations

Prices paid by commercial buyers in the Newfoundland lobster market are determined by the Boston market price. Prices to fishermen are 70 percent of the Boston price, which is determined through seasonal fluctuations in supply of lobster and by a system of open and closed seasons in Canada. This 70 percent price rule is consistently monitored by the Provincial Government.

In 1985, total Canadian exports of fresh lobster to the U.S. amounted to approximately 11,000 tonnes, representing almost 100 percent of American imported fresh lobster while landings of American lobster in the U.S. amounted to approximately 20,000 t. In Newfoundland, total lobster landings amounted to approximately 2,500

tonnes. As noted previously, approximately 75 percent of Newfoundland lobster landings are exported live to the Boston market. The Newfoundland supply represents approximately 18 percent of the Canadian lobster exports to the U.S. and approximately 8 percent of the total American lobster market.

Given the relatively small scale of Newfoundland lobster exports to the United States, the impact of any supply reduction (caused by an increase in carapace length) would have a minimal effect on the market volume and hence on the market price. This is particularly true given that our lobster is exported at a time when American supplies are at their peak.

In the American market place, premium prices are paid for prime "dinner" lobster ranging from 1.2 to 1.5 pounds.[14] Lobsters below and above these sizes currently bring a lower price per unit weight. There is, however, no detailed market price information available to quantify the impact of these size variations. A lobster of carapace measure 3 3/16" is approximately a one pound lobster. Changing the carapace measure from 3 3/16" to 3 1/2" will cause a greater yield of "dinner" lobsters, by shifting the lobster size distribution to be more concentrated in the 1.2 to 1.5 lb. range. A minimum size of 3½" will yield an approximate whole weight of 1.2 pounds.[15]

[14] The Marketing of Canadian Lobsters, F.J. Doucet Consultant Ltd. for Marketing Services Branch, DFO, Ottawa.

[15] Fisheries & Populations Biology of Lobsters (Homarus Americanus) at Arnold's Cove, Newfoundland, G.P. Ennis et al., Fisheries Research Branch, DFO, April, 1986.

Local Newfoundland lobster price is a derived price determined by the economics of the American lobster market. Newfoundland fishermen tend to sell their lobster to registered commercial buyers in order to receive UI stamps. Notwithstanding the fact that landed weight was reduced by over 50% when implementing an increase in carapace length, the local commercial sale price would continue to be regulated by the US market. However, the supply shortage may entice somewhat higher prices from local consumers (a typical occurrence when shortages occur). As a consequence, fishermen may receive a local price that is more attractive than the commercial price and which would encourage local sales over commercial sales despite the fact that the latter contributes to UI stamps. Commercial buyers may, to some extent, be forced to pay higher prices to protect their lobster supply. The extent to which this would occur is very difficult to quantify. Estimating the demand curve for local lobster sales is not realistic given that the relationship between price and quantity is influenced by factors like UI and the Boston price. Lobster prices would have to more than double to offset the first year revenue losses due to the reduced supply (assuming the same levels of relative fishing effort across species.)

In the local market, supply reductions in the implementation year can be expected to put upward pressure on lobster prices. In subsequent years, when landings are projected to increase vis-a-vis the base year landings, prices should generally stabilize again.

The provision of higher average size lobster to the American market should capture a marginally better price given that the proportion in the preferred size range of the restaurant trade has been increased. This price increase is expected to persist indefinitely.

For this analysis the following price and market assumptions are presented:

(i) The local price is projected to increase by 25 percent during the year of implementation only and return thereafter to 70 percent of the Boston market price;

(ii) A price premium of 5 percent to be incorporated into the local price reflecting the increase in the average size of lobster. This price increase is conservatively estimated from data presented in: Pricing and Marketing in the Newfoundland Loster Industry' Prepared for Fishing Industry Advisory Board; D. May, Z. Frishman, A. Noonan, March, 1981.

(iii) The same (pre-carapace increase) market shares still hold: 75 percent to the American market; 25 percent consumed locally.

(iii) Changes in Landed Value

The previous section presented the losses in landings after implementation of the increase in minimum size. The incomes of fishermen may drop with the reduced landings, but incomes would also be affected by fluctuations in lobster prices over the period. To assess changes in revenue, flowing from the increase in the legal lobster carapace length, requires an estimate of the change in the

quantity of landings and the price associated with the catch. The revenue flows shown in Table 4 are based on the market and price assumptions outlined in the previous section.

Table 4 describes the changes in revenue to fishermen following an increase in the minimum carapace length in 1985. Revenues are reduced in tne short run (1985-86) with gains beginning in 1987. The purpose of the analysis is to determine if the rate of return of the future revenue stream is large enough to compensate for the short run losses in revenues (using the average 1984 price of $5.72/kg.). The "investment" in the lobster fishery is to build up the stock of lobster, with the cost being the short-term reduction in landings and the return being the long-term increase in landings and landed values.

TABLE 4
PROJECTED LOBSTER REVENUES, 1985-1994

	YEAR										
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Landings (000 kg.)	1365	641	1297	1665	1665	1665	1665	1665	1665	1665	1665
Revenue (000$)	7788	4009	7782	9990	9990	9990	9990	9990	9990	9990	9990
Revenue Change	-	(3779)	(6)	2202	2202	2202	2202	2202	2202	2202	2202

The standard method for assessing an investment when the costs and revenues extend over a period of years is to calculate the internal rate of return[16], solving for r:

$$\sum_{t=1}^{10} \frac{\Delta R(t)}{(1+r)\,t} = 0$$

where $\Delta R(t)$ is the percentage change in revenue for time, t.

Assuming the prices are denominated in constant 1984 dollars, the internal rate of return was calculated for the changes in revenue that occur over a ten year period. For our example, lobster fishermen will lose revenue in 1985 and 1986. Beginning in 1987, however, there will be an annual permanent gain of $2202 for the remainder of the ten year period. These are estimates of gains and losses to the lobster fishery as a whole, and they do not predict what income to any given fisherman might be. Based on our estimates over a ten-year period, lobster fishermen will get an approximate 39 percent return on the financial sacrifice they make during the two years following the increase in the legal measure. This is a rate of return over the whole fishery; to individual fishermen the merits of a change in the legal carapace length may be greater or less than that predicted. Based on 1984 price and assuming all other variables

[16] Biological and Economic Effects of Increasing the Minimum Legal Size of American Lobster in Maine. American Fisheries Society, 1982.

constant, the loss would be recoverable within five years of implementing an increase in the carapace length. It is possible that further upward pressure on price would shorten this payback period.

Impact on Average Enterprise

The degree to which lobster contributes to the total landed value of an individual fisherman will also affect his perception of whether the initiative is worthwhile and whether he can afford the initial loss in revenues.

The following quantifies the relative scale and importance of the lobster fishery to the average lobster fisherman. The 1984 Costs and Earnings survey contains data on 115 inshore lobster enterprises in the Newfoundland Region. These represent fishermen licenced to:

a) fish lobster only;
b) fish lobster and other restricted species, i.e. salmon;
c) fish lobster, restricted species, and/or groundfish.

Of these 115 inshore enterprises, 104 are in the four main lobster fishing areas as follows:

i) Notre Dame Bay (Area B) - 52 enterprises;
ii) Bonavista Bay (Area C) - 18 enterprises;
iii) Placentia Bay (Area H) - 19 enterprises;
iv) Fortune Bay (Area I) - 15 enterprises.

These four areas, in 1984, landed 91 percent of the total lobster landings in the Newfoundland Region.

Although the Costs and Earnings survey is not designed to specifically capture data on the lobster fishery, Table 5 shows that, in fact, for the four main lobster fishing areas, the composition of the 1984 sample is certainly adequate to draw some valid conclusions (1984 is the most recent year for which Cost and Earnings information is available and is consistent with available data on lobster landings).

TABLE 5

1984 SAMPLED LOBSTER ENTERPRISES

Area	Sampled Lobster Enterprises	Full-Time Lobster Licence	Sample %
B	52	881	6%
C	18	273	7%
H	19	374	5%
I	15	200*	7.5%

*estimated.

Generally speaking, the rate of utilization of lobster licences is very high. A review of the 1984 costs and earnings database revealed that all enterprises which possess a lobster licence are indeed utilizing that licence. The following tables show the contribution of lobster to total landings and landed value for the average (sampled) inshore lobster fishing enterprise, by these four main statistical areas.

TABLE 6
LOBSTER ENTERPRISE AVERAGE LANDINGS (KG), 1984

	AREA							
	B		C		H		I	
		%		%		%		%
Groundfish	11,091	83	19,055	83	19,458	73	5,937	70
Pel./Est.	1,465	11	2,901	13	5,764	22	621	7
Lobster	772	6	877	4	1,254	5	1,968	23
TOTAL	13,328	100	22,833	100	26,476	100	8,526	100

NOTE: Other Molluscs & Crustaceans are negligible.

TABLE 7

LOBSTER ENTERPRISE AVERAGE LANDED VALUE, 1984

	AREA							
	B		C		H		I	
		%		%		%		%
Groundfish	$ 5,493	51	$ 6,315	55	$ 6,773	44	$ 2,728	20
Pel./Est.	931	9	1,189	10	619	4	620	5
Lobster	4,284	40	4,097	35	8,032	52	9,806	75
TOTAL	$10,710	100	$11,601	100	$15,424	100	$13,154	100

NOTE: Other Molluscs & Crustaceans are negligible.

As can be seen from Table 7, the average lobster earnings account for a considerable portion of enterprise revenue, ranging from 35 percent to 75 percent as shown. These are, of course, average estimates for each area based on the sample data. Tables 8 and 9 outline the distribution of lobster revenue by area, and the contribution of lobster landed value to enterprise landed value.

TABLE 8
NUMBER OF ENTERPRISES
RANGE OF LANDED VALUES OF LOBSTER LANDINGS

	AREA			
	B	C	H	I
0 - $2,000	16	3	1	0
$2,000 - $4,000	17	6	2	1
$4,000 - $6,000	12	7	8	4
$6,000	7	2	8	10
	52	18	19	15

TABLE 9
CONTRIBUTION OF LOBSTER TO ENTERPRISE REVENUE

	AREA			
	B	C	H	I
0 - 25%	11	5	2	0
25 - 50%	16	3	5	2
50 - 75%	13	5	7	0
75 - 99%	6	2	0	11
100%	6	3	5	2
	52	18	19	15

A comparison of average biological test site data with these average landings and landed value data provided a measure of the impact of increased carapace length to the "average" lobster fishermen.

It is assumed that there will be a 53 percent projected loss of weight in 1985 (the year of implementation) due to the increase of minimum legal size, for the average lobster fishermen. For example, in Notre Dame Bay, this will mean an reduction of 409 kg. in the

landed weight of lobster from 772 kg. to 363 kg. His lobster earnings will be correspondingly reduced from $4,416 to $2,363 (under the previously outlined pricing assumptions). This translates into a 20 percent reduction in his present total landed value from all species, during the year of implementation. (Assuming that fishing effort per species remains unchanged.)

The resultant changes in landings and value for Notre Dame Bay and the other three main lobster harvesting areas are presented in the Tables 11 -14 on the following two pages.

TABLE 10
CHANGE IN TOTAL LANDED VALUE (ALL SPECIES) FOR THE AVERAGE (SAMPLED) INSHORE LOBSTER ENTERPRISE (WITH 1985 INCREASE IN MINIMUM CARAPACE LENGTH)

YEAR				
	B	C	H	I
1984	-	-	-	-
1985	(20%)	(18%)	(27%)	(38%)
1986	(2%)	(2%)	(3%)	(4%)
1987	+11%	+10%	+14%	+21%

For example, in Area B as mentioned earlier, the reduced landings of lobster in 1985 cause a 20 percent reduction in total landed value to the average lobster fisherman. In 1986, with everything else remaining constant, Notre Dame Bay lobster fishermen experience a reduction of only 2 percent in total earnings from 1984 levels. In 1987, when the full effect of the increased yield/recruit is realized, the average lobster fisherman begins to recapture some of his two year losses with a 11 percent increase (over 1984) in total landed value. Table 10, above, outlines this situation for each of the four areas.

TABLE 11

CHANGES IN LOBSTER LANDINGS AND VALUE FOR THE AVERAGE (SAMPLED) INSHORE ENTRPRISE IN AREA B - NOTRE DAME BAY

Year	Landings (000 kg.)			Landed Value ($)			Landings Net Change			Landed Value Net Change		
	Lobster	Other	Total	Lobster	Other	Total	Lobster	Other	Total	Lobster	Other	Total
1984	772	12,556	13,328	4,416	6,424	10,840	-	-	-	-	-	-
1985	363	12,556	12,919	2,363	6,424	8,787	(409)	-	(409)	(2,053)	-	(2,053)
1986	733	12,556	13,289	4,398	6,424	10,822	370	-	370	2,035	-	2,035
1987	942	12,556	13,498	5,652	6,424	12,076	209	-	209	1,254	-	1,254

TABLE 12

CHANGES IN LOBSTER LANDINGS AND VALUE FOR THE AVERAGE (SAMPLED) INSHORE ENTERPRISE IN AREA C - BONAVISTA BAY

Year	Landings (000 kg.)			Landed Value ($)			Landings Net Change			Landed Value Net Change		
	Lobster	Other	Total	Lobster	Other	Total	Lobster	Other	Total	Lobster	Other	Total
1984	877	21,956	22,833	5,016	7,504	12,520	-	-	-	-	-	-
1985	412	21,956	22,368	2,682	7,504	10,186	(465)	-	(465)	(2,334)	-	(2,334)
1986	833	21,956	22,789	4,998	7,504	12,502	421	-	421	2,316	-	2,316
1987	1,070	21,956	23,026	6,420	7,504	13,924	658	-	658	1,422	-	1,422

TABLE 13

CHANGES IN LOBSTER LANDINGS AND VALUE FOR THE AVERAGE (SAMPLED) INSHORE ENTRPRISE IN AREA H - PLACENTIA BAY

Year	Landings (000 kg.)			Landed Value ($)			Landings Net Change			Landed Value Net Change		
	Lobster	Other	Total	Lobster	Other	Total	Lobster	Other	Total	Lobster	Other	Total
1984	1,254	25,222	26,476	7,173	7,392	14,565	-	-	-	-	-	-
1985	589	25,222	25,811	3,834	7,392	11,226	(665)	-	(665)	(3,339)	-	(3,339)
1986	1,191	25,222	26,413	7,146	7,392	14,538	602	-	602	3,312	-	3,312
1987	1,530	25,222	26,752	9,180	7,392	16,572	339	-	339	2,034	-	2,034

TABLE 14

CHANGES IN LOBSTER LANDINGS AND VALUE FOR THE AVERAGE (SAMPLED) INSHORE ENTERPRISE IN AREA I - FORTUNE BAY

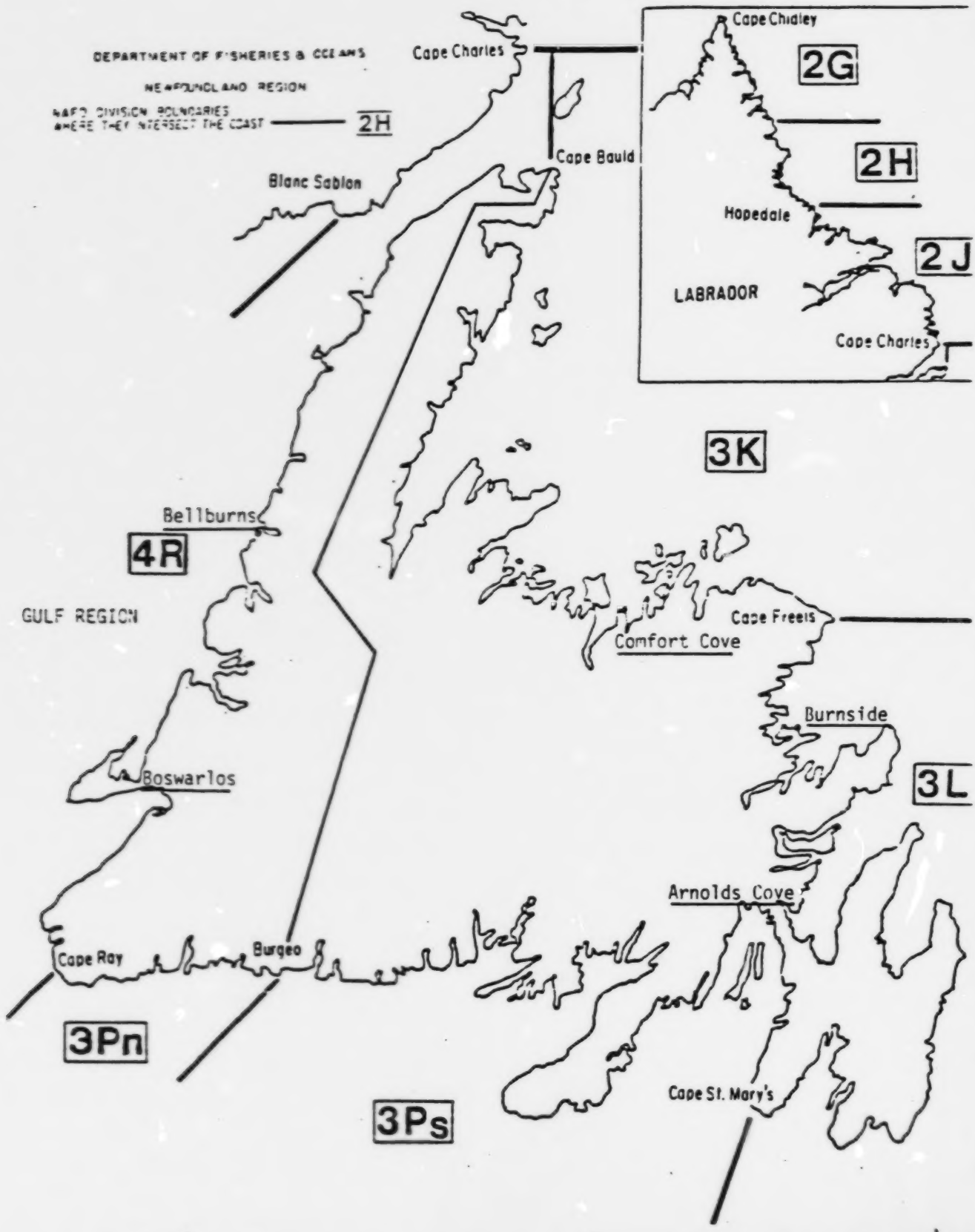
Year	Landings (000 kg.)			Landed Value ($)			Landings Net Change			Landed Value Net Change		
	Lobster	Other	Total	Lobster	Other	Total	Lobster	Other	Total	Lobster	Other	Total
1984	1,968	6,558	8,526	11,257	3,348	14,605	-	-	-	-	-	-
1985	925	6,558	7,483	6,022	3,348	9,370	(1,043)	-	(1,043)	(5,235)	-	(5,235)
1986	1,870	6,558	8,428	11,220	3,348	14,568	945	-	945	5,198	-	5,198
1987	2,401	6,558	8,959	14,406	3,348	17,754	531	-	531	3,186	-	3,186

V. CONCLUSION

There are approximately 3,000 lobster licences (1985) issued in the Newfoundland Region registered to fish 405,000 traps. Seventy-five percent of these licences are issued for the four main lobster harvesting areas. A one year increase in the minimum legal carapace size will seriously affect the economic performance of lobster enterprises in these areas where it contributes such a significant portion of total income.

For the average sampled lobster fisherman, the first year losses in landed weight will mean reductions in total landed value ranging from 21 percent to 39 percent (Table 10). This is based on the constraining assumption that fishermen will direct the same effort to each species group before and after the increased measure regulation. However, in subsequent years, the gains expected in landed weight begin to offset up-front losses and over the ten year analysis period the internal rate of return over the whole fishery is 39 percent. An increase in the minimum legal carapace measure is economically attractive in the sense that future revenue streams are sufficiently large under a set of conservative estimates to offset initial losses and support a compensation fund designed to minimize the impact of the initial loss via a special charge on the future revenue stream.

FIGURE 1: NORTH ATLANTIC FISHERIES ORGANIZATION
DIVISION BOUNDARIES, NEWFOUNDLAND AND LABRADOR



PUBLICATIONS LISTING

PUBLICATIONS LISTING OF THE PROGRAM COORDINATION AND ECONOMICS BRANCH FISHERIES AND OCEANS P.O BOX 5667 ST. JOHN'S, NFLD.

1984

1. An Assessment of the Economic Viability of the Northern Shrimp Fishery, 1983, K. Voutier, January, 1984.

2. Costs and Earnings of Selected Inshore and Nearshore Fishing Enterprises in the Newfoundland Region - 1982, Economics Branch, March, 1984.

3. Economic Indicators of Inshore and Nearshore Fishing Enterprises 1979-1982, Economics Branch, March, 1984.

4. The Processing Sector North of 50° Latitude: A Financial Profile, J.E. Davis and W.M. Follett, July, 1984 (INTERNAL-CONFIDENTIAL)

5. An Economic Assessment of the Middle Distance Longline Pilot Project Using the Norwegian Longliner MV KELTIC, M.C. Grandy, July, 1984

6. Costs and Earnings of Selected Inshore and Nearshore Fishing Enterprises in the Newfoundland Region - 1983, Economics Branch, September, 1984.

7. The Socio-Economic Importance of the Commercial Salmon Fishery in Newfoundland and Labrador, A Report Prepared for the 1984 Atlantic Salmon Task Group by Economics Branch, Department of Fisheries & Oceans, Nfld. Region, October, 1984.

8. Benefit/Cost Analysis - Direct Sales Program - Newfoundland Region, 1984, Brian Donahue, November, 1984

9. An Economic Assessment of the 1982 St. Pierre Bank Scallop Fishery, M.C. Grandy, December, 1984.

10. An Economic Assessment of the Purse Seine Fishery in the Newfoundland Region, M.C. Grandy, December, 1984.

11. Economic Indicators of Inshore and Nearshore Fishing Enterprises in the Newfoundland Region 1979-1983, Economics Branch, December, 1984

PUBLICATIONS LISTING

1985

12. An Economic Assessment of Inshore and Nearshore Groundfish Enterprises in NAFO Divisions 3K, 3L and 3Ps - 1981-83, Kenneth A. Carew and Keltie C. Voutier, September, 1985.

13. Costs and Earnings of Selected Inshore and Nearshore Fishing Enterprises in the Newfoundland Region - 1984, Economics Branch, September, 1985.

14. The Economic Impact of the Newfoundland and Labrador Commercial Salmon Fishery: An Intra-Regional Study of Dependence - 1983, M.C. Grandy, September, 1985.

15. Economic Indicators of Inshore and Nearshore Fishing Enterprises in the Newfoundland Region 1979 - 1984, Economics Branch, October, 1985.

16. Sampling Methodology of the 1984 Fishing Enterprise Costs and Earnings Survey, Newfoundland Region. Economics Branch, October, 1985.

17. Regulatory Reform and the Atlantic Fishery - A Discussion Paper. M.C. Grandy, October, 1985.

1986

18. Economic Analysis of the 1984 Resource Short Plant Program - Newfoundland Region, J.E. Davis, (Prepared August, 1985)

19. Benefit/Cost Analysis, Direct Sales Program, Newfoundland Region, 1985. Brian Donahue, August, 1986.

20. Costs and Earnings of Selected Inshore and Nearshore Fishing Enterprises in the Newfoundland Region - 1985, Economics Branch, September 1986.

21. Economic Indicators of Inshore and Nearshore Fishing Enterprises in the Newfoundland Region 1981-1985, Economics Branch, September 1986.

22. The Economics of the Crab Fishery, Newfoundland Region, 1979-85. J.F. Collins, November, 1986.

23. The Economic Effect of Increasing the Legal Lobster Carapace Length, Brian Donahue, November, 1986.